MS221 CG

The Open University

EXPLORING MATHEMATICS

Course Guide

COURSE GUIDE

4.1

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Contents

1 Introduction

Welcome to MS221 *Exploring Mathematics*. We hope that you will find the course enjoyable and rewarding!

This *Course Guide* gives you an overview of the learning outcomes of the course, the course components, assessment and study support, to help you plan your study.

If you are studying MST121 and MS221 together, then you will have received preparatory materials. If you are studying only MS221, then the most useful revision material for this is Blocks A, B and C of MST121. You should also have an appropriate computer running *Windows*, and be familiar with the basic operation of *Windows*.

On successful completion of MS221, you will be well prepared to study further mathematics courses as well as other courses that *use* mathematics. You will also have gained experience in using mathematical software, and should have developed general skills for learning and communicating mathematics.

2 Course learning outcomes

The following list of outcomes indicates what you should be able to do by the end of the course.

Knowledge and understanding

You should be able to:

- ◇ Extend your familiarity with an increased range of mathematical language and objects.
- ◇ Develop new ideas and extend your ways of mathematical thinking.
- ◇ Develop an appreciation of the need for justification or proof.

Cognitive skills

You should be able to:

- ◇ Increase your range of mathematical language and knowledge of mathematical objects.
- ◇ Work with a greater range of mathematical objects using coordinate geometry, including conic sections.
- ◇ Develop your work with matrices to include matrix transformations and diagonalisation.
- ◇ Perform more difficult differentiation and integration.
- ◇ Work with some pure mathematical ideas such as complex numbers and simple groups.
- ◇ Be able to write certain types of mathematical proof, and to use the concept of a counter-example.

Key skills

You should:

- ◇ Develop further your own learning and performance (e.g. ability to organise study time, to study independently, to learn from feedback, to meet deadlines).
- ◇ Develop further skills for communicating mathematical ideas.
- ◇ Begin to appreciate mathematical proof and be able to write down some simple proofs.
- ◇ Develop further your skills in the use of a computer algebra package (*Mathcad*).

Practical and/or professional skills

You will gain further experience with the use of a computer algebra package (*Mathcad*), and with logical and mathematical argument.

Your understanding of basic principles and concepts, and the use of techniques, is assessed through TMA questions and an examination. Some questions involve a directed solution to a longer problem, but some other questions give less direction.

Written communication is assessed in the TMAs and in the examination. Improving your own performance is implicit in the course and not explicitly assessed. In many questions credit is given for clarity of presentation.

Evidence of computer work is required as part of TMA answers.

3 The course components

The main MS221 course components are described below.

Study texts

MS221 is made up of the following four **blocks** of study.

Block A Mathematical exploration
Block B Exploring iteration
Block C Exploring continuous models
Block D Structure in mathematics

Each block is divided into several individually bound **chapters**, and has associated with it an **exercise booklet** containing exercises with solutions, and a **computer book** containing software-based activities.

Most chapters in MS221 contain the following elements:

- a **study guide**, which gives information on the structure of the chapter, and an **introduction**;
- several **sections**, with **examples**, **activities** and **comments** on those activities, a **section summary**, and **exercises** to provide practice;
- a **chapter summary**, including a statement of **learning outcomes**;
- **solutions** to activities and exercises.

Some chapters include a **block introduction** or a **block summary**, and some contain an **appendix** related to particular teaching sections.

Your study will be guided by the chapters, and much of your study time will be spent working directly from them. You will gain most benefit from your study if you work with a pencil and paper to hand, reading the chapters, annotating them and making your own notes. We advise you to keep these notes, and others that you make (for example, notes from tutorials and your rough drafts of assignments), in a ring binder or notebook, for ease of reference.

You should also have your calculator and the course *Handbook* available.

Some sections and their activities require the use of resources beyond the chapters themselves. These resources are specified in the chapter study guides, and their associated icons (see below) appear at the beginning of the appropriate sections.

indicates that you will need your computer

indicates that you will need audio CD playback equipment

indicates that you will need DVD playback equipment

In addition, there may be times other than those specified when you wish to use your computer to check something. When using your computer, do avoid sitting at the screen for long periods without a break, and keep a pencil and paper to hand for any notes that you need to make.

On average, most students are able to study a chapter from the course in about 15 hours, including working through the associated computer work, audio-visual material and the relevant assignment questions. If you studied MST121 previously, you may need to look back at some of the material to review your knowledge before working through a chapter of MS221. If you are studying MS221 and MST121 simultaneously, you will have the advantage that all the material will be fresh in your mind, but there will be very little opportunity to relax, as you need to study a chapter from one course or the other every week. As with MST121, the material in Block C is very important to future courses in mathematics, physics and electronics. In Block D you will tackle some ideas from an area generally known as pure mathematics. In particular, some simple methods of mathematical proof are introduced.

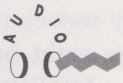
Calculator

You need a scientific or graphics calculator for parts of the course, and for the examination. The graphics calculator used in the course MU120 is suitable, but any scientific calculator should be sufficient. If you are not familiar with your calculator, then you should practise using it with the help of its manual, preferably before the course begins.

Computer software

The software package *Mathcad* and associated course files are supplied on the CD-ROM in the same mailing as this *Course Guide*. Installing *Mathcad* and the course files is described in Chapter A0 of MST121. The activities associated with these course files are given in the computer books. The document *A Guide to Mathcad* provides a source of reference to the features of *Mathcad* used in the course.

Audio bands



Audio bands are used in some parts of the course, to talk you through material printed in the text. Do stop, start and replay these bands as often as necessary.

Video bands

The DVDs include video bands of various types. Some of the bands are linked directly to the main course texts, and should be used when indicated by these texts and on the *Study Calendar*. The 'Algebra workout' bands cover more general techniques in algebra, taking you through the basic step-by-step.

Band A(i)	*Algebra workout: Rearranging formulas*
Band A(ii)	*Algebra workout: Square roots*
Band A(iii)	*Visualising conics*
Band A(iv)	*Algebra workout: Trigonometry*
Band A(v)	*Visualising isometries*
Band B(i)	*Algebra workout: Binomial Theorem*
Band B(ii)	*Algebra workout: Finding matrix transformations*
Band B(iii)	*Algebra workout: Eigenvectors*
Band B(iv)	*Weaving spirals*
Band C(i)	*The birth of calculus*
Band C(ii)	*Algebra workout: Differentiation*
Band C(iii)	*Integration*
Band C(iv)	*Algebra workout: Integration*
Band C(v)	*Algebra workout: Taylor polynomials*
Band D(i)	*Algebra workout: Complex numbers*
Band D(ii)	*Roots of polynomials*
Band(iii)	*Algebra workout: Modular arithmetic*
Band(iv)	*Algebra workout: Mathematical induction*

Supplementary video material

A series of fifteen video bands on two DVDs is associated with the three courses MU120, MST121 and MS221. You are likely to find all of these programmes interesting and enriching as you study, but some are more explicitly associated with MS221 course chapters. The first DVD comprises eight bands associated with MU120, and the second has four bands for MST121 and three for MS221.

Study Calendars

There are two *Study Calendars*, one for MS221 only, and one for MST121 and MS221 together.

These *Study Calendars* give the starting date for each chapter and the dates when the assignments are due. They also give schedules for the audio and video bands. Please make sure that you use the *Study Calendar* which applies to the course(s) you are studying.

Handbook

The MS221 *Handbook* contains a list of notation and a glossary of technical terms, arranged alphabetically, together with key results and formulas, organised according to the chapter in which they appear.

The *Handbook* is a key source of reference throughout the course. You are allowed to take it into the examination, and you can add your personal annotations to it. In theory, therefore, there is no need to memorise material from the course. However, the more notation and terminology you can remember and understand, the easier you will find it to study the course materials and to do assessment questions confidently.

If you are studying MST121 as well, we recommend that you use just the MS221 *Handbook*.

The MS221 *Handbook* includes the material from the MST121 *Handbook*.

It is a good idea either to use a pencil or to use 'Post-it' stickers for your annotations until you are confident which type suits you best.

If you started MST121 in October, you should change to using the MS221 *Handbook* now.

Stop Presses

The *Stop Presses*, printed on pink paper, act as a course newsletter containing useful and often essential information, such as errata, how to report other errors, what to do if you need help, and more detailed descriptions of the video bands.

It is important to read each Stop Press as soon as it arrives, and to make a note of any points which affect you.

FirstClass computer conferences

There is an MS221 'News' conference on FirstClass, as well as an MS221 student conference.

4 Assessment

Components of assessment

There are two components of assessment, each marked out of 100:

- continuous assessment, through four **tutor-marked assignments** (TMAs);
- an **examination**.

TMAs are contained in the **assignment booklets**. The *Study Calendar* gives the dates by which assignments should be completed. The **cut-off date** for a TMA is the last date on which your tutor may accept your work for marking, unless he or she feels that there are exceptional reasons why you should be allowed to submit late.

It is important to plan your study to include time to work on the assignments, allowing time to refine and check what you write – and perhaps to act on any advice that you might seek from your tutor.

The examination is a three-hour script-marked paper. Details of this will be sent later in the year, together with a *Specimen Examination Paper* with sample solutions, to guide your revision.

Your overall grade

Your overall grade depends on your performance in *both* the continuous assessment and the examination. You will be awarded a mark for each TMA that you submit. These marks are combined with your mark from the examination to give an overall grade for the course.

Consult the *Assessment Handbook* for further information on these matters.

Note that your overall grade may be improved by **substitution**. Under this system, your lowest TMA mark is replaced by a 'substitution mark' (if this is higher), computed from all your marks for the course, and only then is your overall grade computed. If substitution would benefit your overall score, the process is carried out automatically. The effects of this system are that:

- you are not penalised too severely for one low TMA mark;
- it is advantageous to submit **all** the TMAs, even if you are not able to do yourself justice on some parts.

You will also receive useful feedback.

MS221 is a Level 2 course, so one of five grades can be awarded: each of grades 1–4 is a pass and grade 5 is a fail.

If you are awarded grade 5, but have achieved satisfactory marks on the continuous assessment and a mark on the examination that is not too far below a pass, then you will be entitled to carry your continuous assessment marks forward and resit the examination in the following year.

5 Study support

Your tutor

Your Regional Centre will send you the name and address of your tutor, who will support your academic study and provide feedback on your work. Every TMA that you submit on time should be returned marked by your tutor, with comments. These comments should point out what you have done well, while indicating any misunderstandings and errors, and giving advice on how to avoid these. TMAs are the basis for correspondence tuition, and should enable you to establish a dialogue with your tutor.

You will receive details of other ways in which your tutor may offer you support, for instance with face-to-face tutorials or computer conferences. You will be able to obtain details of face-to-face tutorials provided by other tutors, which you are entitled to attend. You are strongly encouraged to attend face-to-face tutorials, if it is feasible for you to do so, as they provide an opportunity to receive focused tuition, to work with other students, and to discuss your own questions.

If it is impossible for you to take part in organized activities, please make contact with your tutor, and maintain contact through telephone, email, letters or fax.

Other students

Talking with fellow students about the mathematics you are studying is a valuable way of enhancing your learning. There are opportunities for this at tutorials, and you can arrange further contact by exchanging addresses, email addresses or telephone numbers with other students in your area, perhaps forming a 'self-help group'. It may be possible to book a room at a study centre for self-help meetings; if so, your Regional Centre will be able to supply details. In addition to any local arrangements that you may make with your tutor and fellow students, the Open University Students Association (OUSA) supports a computer conference for MS221 students, using FirstClass software.

Telephone help-lines

As mentioned above, you may choose to contact your tutor and fellow students by telephone. You may also wish to use telephone help-lines. For example, there is a **telephone tutorial service** run on a voluntary basis by members of the Faculty of Mathematics and Computing who endeavour to answer your queries. There is also a **computing help-line** to support students on courses which involve the use of a personal computer (like MS221).

Details about these services are given in *Stop Presses*.

Other support

Regional Centres provide all students with study support for problems that are not directly related to the course materials. New students studying MST121 and MS221 will usually receive this support from their tutor. If you have any non-academic problems affecting your Open University studies you should consult the **Study Support Team** at your Regional Centre.

Details about the Study Support Team are given in the literature sent from your Regional Centre.

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